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NATURAL OCCURRENCE OF EOSINOPHILIAS

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When the juices obtained from Hypoderma larvae, either diluted or otherwise, are injected under the skin of a susceptible animal, the first effect noticed will be local. At the point of injection a blister-like spot will be seen, and a necrotic area will occur. In twenty minutes to half an hour, swelling will be noted. The necrotic spot in the center will be depressed. Smears made from the swelling some hours later, reveal the presence of an eosinophilia, and if the material which was injected contained bacteria, phagocytosis by the eosinophils. This observation of phagocytosis by the eosinophils was made by myself and certified by Dr. B. H. Ransom at Washington, D. C. The reason for the eosinophils assuming the rôle which is usually assigned to the neutrophils, is apparently because the bacteria are rendered attractive by their being bathed in the verminous juices. These cells containing bacteria are not numerous, and were only found in a few cases. According to Weinberg and Séguin (1914, 1915), in their reports on the experimental injections of the juices of *Ascaris* and other intestinal parasites, the principal function of the eosinophils is to neutralize toxins, but they also ingest small particles of débris or bacteria when they are present in verminous fluids. They were also successful with mixtures in vitro. These findings seem to indicate that the eosinophils play a very important rôle in picking up the bacteria which are introduced into the body by the bites of intestinal parasites, and in neutralizing toxins which may be absorbed. The swelling which follows these injections may persist for several days. The same effect may be produced by puncturing or crushing a warble larva "in situ" under the skin. The liberation of the proteins contained in the grub causes a local swelling, anaphylactic in type and stimulate an eosinophilia. When a smear is made from the contents of the swelling, large numbers of eosinophils are seen and innumerable granules. Proof that the eosinophils are attracted by the secretions and excretions of warble larvae alone and not by bacteria, can be found by examining the fluids in the edemas surrounding them in the gullet. Here the larvae are usually sterile as I have proved by examining numerous slides, also by extracting the grubs and incubating them in bouillon. Three out of four grubs thus extracted proved to be sterile. Further, the grubs which were found in the neutral canal in a

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number of other animals (7 in one case) must also have been sterile, as only small edematous tracks and gray areas in the fat were noted. In the gullet the eosinophil was the principal cell encountered. There were only a few neutrophils and a smaller percentage of mononuclears and macrophages. Pus was taken from the cavities beneath the skin of cattle in which warble larvae were living. Eighteen cows were examined and in only two instances did I find bacteria in large numbers. In one of these, it was only after a prolonged search that an eosinophil was found. In the other, only an occasional one. In the sixteen other smears eosinophils were plentiful and bacteria correspondingly scarce. Differential counts were attempted, but of course, only give a rough idea of the percentage owing to the degenerated condition of many of the cells. In one case the neutrophils were 75%, the mononuclears 12.5%, the eosinophils 7.5% and the macrophage cells 4.4%. On the same date the blood taken from the general circulation showed neutrophils 25.75%, the mononuclears 68% and the eosinophils 6.25%.

No doubt the large percentage of the neutrophilic leukocytes in the pus smears was due in part to the presence of bacteria, as in the swellings of the gullet they were only found in small numbers.

The percentage of the eosinophils in many of the other cases was not as high as in the example given and in one of them it was as low as 2%. If, however, there had been no bacteria with which to contend, it is probable that the percentage would have been higher owing to the presence of fewer neutrophils.

Another experiment might be cited to prove that the eosinophile cell is *par excellence* the agent which truly repels and neutralizes verminous products. A few drops of warble juice were instilled into a steer's eye at 10 a. m., and at 7:30 p. m. smears were made from the discharge. The cells were practically all eosinophils.

These experiments are a continuation of the work recorded by E. A. Bruce and myself in 1916, relating to the injection of juices derived from oestrid larvae, and of later experiments made in collaboration with Dr. B. H. Ransom at Washington, D. C. Nearly all the publications to which I have had access, discussing injections of verminous juices, have reference to those inhabiting the intestines, and though the fluids from the parasites may have been rendered sterile by filtration, their proteins may have become mixed during the process of absorption or ingestion of the intestinal contents by the parasites (the hydatid cyst fluids excepted). *Hypoderma* larvae are very suitable for such experiments, seeing that they are sterile until they bore through the skin, and they nourish themselves solely on animal tissues. It is a well-known fact that, as a rule, in verminous anemias the percentage of eosinophils is high, but in some instances they may be very scarce. Weinberg and Séguin noted this in their experiments and suggest that the few eosinophils which were in the circulation had been attracted to the parts affected in order to repel a verminous invasion.

Experiments are contemplated to determine what curative effects the injection of worm juices may have on such cases.

I am indebted to Dr. Ransom for sending me two important papers recently, by Marchesini and Barnett which bear on this subject.

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